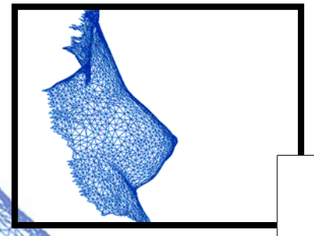
An expert is a man who has made all the mistakes which can be made in a very narrow field.

—Niels Bohr

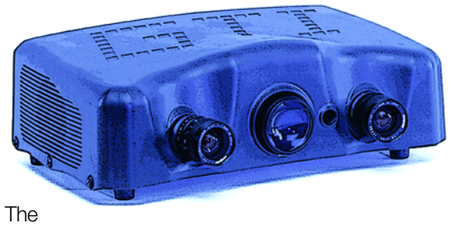


A mastectomy patient opts for breast reconstruction. During surgery, the doctor does his best to visualize the size and shape of the new breast. After the surgery, however, the patient realizes that her breasts do not match. Here is a product that gives surgeons a more scientific method of determining volume differences for breast reconstruction.

3D BreastSim™

How It Helps: The 3D BreastSim imaging system and software increases the accuracy and speed of breast reconstruction and augmentation and reduction surgeries. Whether in a pre-operative consultation or during surgery, doctors need a quick, accurate method to determine the volume of an existing breast so that the reconstructed one will closely, if not perfectly, match. Traditionally, laser line scanners have been used to provide the data to generate three-dimensional models, but these devices are slow and have difficulty operating when the object being scanned moves, even slightly. The 3D BreastSim imaging system captures full-frame images in less than a second. More than 440,000 data points are collected for each image. A lightweight, compact design makes the system portable and adaptable to nearly any medical environment.

How It Works: The 3D BreastSim imaging system includes a device that projects white light through a cylindrical lens that fans the beam. This beam passes through a linear variable wavelength filter to produce a continuous color spectrum, much like the rainbow effect from a prism. This rainbow of light illuminates the breast. Reflected light is detected by two color charge-coupled devices (CCDs), which convert these reflections into digital signals. Proprietary software uses this digital data to mathematically compute the x, y, and z locations for each pixel of the image created by the CCDs. Once the locations are known for every pixel in the image, a true three-dimensional model of the breast can be displayed.



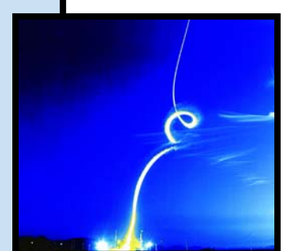
How Much It Will Cost: The 3D BreastSim and its associated software can be purchased for about $5,000.

When It Will Be Ready: This product is available now. The 3D BreastSim has been sold to early technology adopters such as plastic surgeons and university hospitals. The technology is also being evaluated for use in doctor-patient planning and communication before breast augmentation/reduction surgeries.

Who Is Working On It: The innovator is Genex Technologies, Inc. (GTI). GTI develops leading-edge electronic imaging technologies and delivers proprietary hardware/software solutions. The company was ranked #257 in the *2002 Inc. 500*, a comprehensive guide to America's fastest-growing private companies published by Inc. magazine. Founded in 1996 by Dr. Jason Geng, GTI employs 15 people and occupies 7,000 square feet of office and laboratory and development space. For more information, contact Dr. Jason Geng of GTI at (301) 962-6565 or geng@genextech.com. The company Web site is www.genextech.com.

MDA Origins

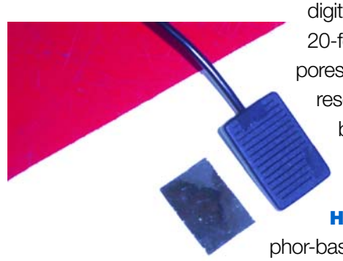
The product's origin can be traced back to research GTI conducted for BMDO. In 1996, BMDO awarded GTI an SBIR Phase I contract to integrate an innovative 3-D camera with a true volumetric display device. Combined, the two technologies would bring a new level of realism to simulation, training, and battlefield management. A sensor platform of 3-D cameras, for example, could help detect and track incoming missiles by feeding trajectory data to a 3-D display system at the command and control center. In 1997, BMDO awarded GTI a follow-on Phase II contract to develop a prototype.



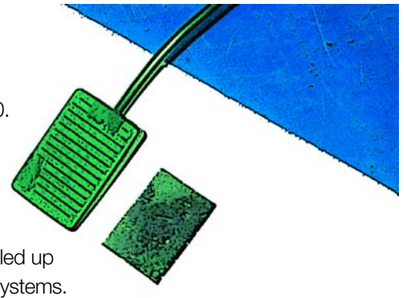
Here is a numbing fact: Fewer than 10 percent of dentists in the United States use digital imaging systems to record, enlarge, store, and transmit x-ray images of a patient's teeth. Digital imaging equipment is often bulky—which clutters small dental offices—and expensive, leading many dentists to continue using traditional film-based systems. Here is a product that makes digital x-ray imaging more attractive to dentists.

Digital Imaging Sensor

How It Helps: By providing higher resolution, improved contrast, and reduced radiation dosages, the digital imaging sensor may convince more dentists to switch from film to digital x-ray imaging. The device uses doped nanocrystalline (DNC) phosphors that can be modulated to increase light output, thereby enabling higher contrast and requiring less radiation than other digital x-ray detectors. To date, light output has been increased about 20-fold. The containment of the light within the small, closely packed pores of the device's micro-channel plate (MCP) enables increased resolution. The smaller size of the nanophosphor-based scintillator bonded to the complementary metal-oxide semiconductor (CMOS) sensor allows the unit to fit easily inside the patient's mouth.



How It Works: The digital imaging sensor consists of a nanophosphor-based scintillator integrated with a CMOS sensor. The scintillator, which converts x-ray radiation into visible light, consists of an MCP composed of between 2 and 3 million channels per square inch, each deposited with DNC phosphors. These DNC phosphors use quantum-confined atoms to emit above-normal amounts of light when acted upon by radiation. The individual channel walls of the MCP reflectively transmit the visible light generated by the DNC phosphors, similar to optical fiber, toward the CMOS sensor for digital detection. The small channels both enhance and prevent light scattering to help produce high resolution and contrast digital images that can be stored or displayed on a computer screen.



How Much It Will Cost: The digital imaging sensor and accompanying software can be purchased for about $3,500.

When It Will Be Ready: The product is slated for production in mid-2003. Prototypes have been successfully tested by the leading manufacturers of dental imaging sensors in Europe and Japan. The technology is also being scaled up and evaluated for use in retrofitting current mammography systems.

Who Is Working On It: Nanocrystals Imaging Corporation (NIC) developed this product. The company was founded in 1997 as a spinoff of Nanocrystals Technology (NCT), LP (which has raised more than $5 million in funding from private investors, mostly doctors) to exploit discoveries in the creation of high-quality digital x-ray images. NIC employs eight people and occupies 3,000 square feet of office and laboratory space. For more information, contact Dr. Rameshwar Bhargava of NIC at (914) 923-1142 or rbhargava@nanocrystals.com. The company Web site is www.nanocrystals.com.

MDA Origins

NCT developed the nanophosphor-based scintillator as part of its BMDO SBIR research. The company had already developed its DNC phosphors when, in 1994, the company applied for and won an SBIR Phase I contract from BMDO. This research aimed to measure the light-output potential of the materials. In 1999, the company won a BMDO SBIR Phase II contract to build the DNC-based scintillator, combine it with a CMOS sensor, and produce high-resolution images. BMDO supported this technology because it could be combined with x-ray, ultraviolet, or visible radiation detectors to create sensitive missile detection and tracking systems.

A deer appears, seemingly out of nowhere, and collides with a car on a secluded highway. The calamitous combination happens more often than people think; one insurance group claims that in 2000, approximately 500,000 deer-automobile collisions resulted in more than 100 human deaths and thousands of injuries. Here is a product that could help prevent these collisions.

Wildlife Protection System™

How It Helps: The Wildlife Protection System provides accurate, real-time warnings of animals approaching the roadways to prevent potentially deadly collisions with motorists. In areas where wildlife-automobile collisions are frequent, highway departments traditionally install bright yellow warning signs. But, after viewing these signs, most people fail to slow down or keep a closer watch for animals near the road. The Wildlife Protection System displays warnings that attract the attention of motorists. When an animal is detected, the system also can automatically trigger the display to show a lower speed limit, further reducing the chances of collision. It can even identify what species of animal is near the road. Because the system can operate in the dark and through fog, rain, and smoke, it also is very reliable.

How It Works: The Wildlife Protection System uses a long-wavelength infrared imaging camera to detect wildlife in a critical area and transmit a signal to any message display, such as a flashing light or digitally illuminated sign. The camera includes a focal plane array, containing quantum well infrared photodetectors (QWIPs), that is highly sensitive to heat energy in the 8- to 12-micrometer wavelength range. This capability allows the camera to see radiation at wavelengths not normally visible to the human eye. Room temperature objects observed at these wavelengths can be seen to radiate the same way red-hot objects glow in visible light. The QWIP array can scan several miles of road and warn motorists long before a collision might occur.

How Much It Will Cost: The price of the product depends on the geography of the area, sophistication of the system, and available infrastructure. Man-made subterranean animal crossings can cost upwards of $1 million. This type of crossing, which typically covers an area of 300 meters or more, easily could be replaced with a $125,000 Wildlife Protection System. A larger, more advanced system covering one kilometer or more costs about $200,000.

When It Will Be Ready: The product will be available in mid-2003. It is being tested in the Kootenay National Park of Canada. An advanced version of the system, which is being developed, will warn motorists about other objects on the highway, including ice, debris, and even road kill.

Who Is Working On It: InTransTech, Inc., is commercializing this technology. Founded in 1991, the company applies cutting-edge technology to transportation safety. It employs two people and occupies 1,000 square feet of office space and research facilities. InTransTech has the exclusive rights to transportation applications of the QWIP technology through its parent company, the Rainbow Group. QWIP technology was originally developed by NASA's Jet Propulsion Laboratory (JPL) and licensed by QWIPTech, another subsidiary of the Rainbow Group. For more information, contact Dale Keep of InTransTech at (509) 525-3197 or dalekeep@innw.net. The company Web site is www.intranstech.com.

MDA Origins

Throughout the 1990s, BMDO's Innovative Science and Technology program funded JPL to develop QWIP technology for use in ground-based and space-based infrared surveillance at long wavelengths. The technology could detect unheated objects such as ballistic missiles in mid-course, when the hot rocket engine is not burning.